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Knuckle joint between piston and connecting rod, in particular for pistons of internal combustion engines

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The invention relates to a knuckle joint between piston and connecting rod, in particular for pistons of internal combustion engines, in which a bushing consisting of one or more pieces and secured against rotation about the piston pin surrounds the piston pin, the outside of which bushing serves as load-carrying and bearing surface for the connecting rod small end.

5 The object of the invention is for only a very small amount of the frictional heat of the bushing to be transmitted to the piston. This is achieved according to the invention in that good cooling of the bushing is ensured. The invention is characterised in that there are provided in the surface with which the bushing sits on 10 the piston pin annular channels, indentations or other turned grooves which prevent heat transfer or serve as circulating spaces for cooling fluid or the lubricating oil used for cooling. The bore in the bushing is thus so designed that only individual, separate load-carrying surfaces, preferably annular ridges, of the bushing meet with the pin, while the remaining parts of the bore are recessed, such that in this way cavities 15 preventing heat transfer are formed. The above-mentioned cavities may also be used as cooling chambers, by passing a circulating cooling fluid through them. One or more of the cavities may also form elements of the forced-feed lubrication system, such that lubricating oil flows through the cavities, the latter being connected in part 20 with the feed duct of the forced-feed lubrication system and in part with the load-carrying surfaces between the bushing and the bearing of the connecting rod small end.

One embodiment of the invention is illustrated in the drawing, which shows a longitudinal section through the piston pin and parts of the piston and connecting rod of a knuckle joint constructed according to the invention.

25 1 is the piston surrounding the small end 19 of the connecting rod 18 in conventional manner. The above-mentioned parts are connected together by a piston pin 2, onto the central part of which there is pushed a cylindrical bushing of much larger external diameter than that of the piston pin. The ends of the piston pin 2 are mounted in corresponding holes in the pin bearings 3, 4. The bushing 5 fits without play around the piston pin 2 and the end faces 6, 61 of the bushing are stepped, such 30 that planar locating faces 7, 71 arise in or near a horizontal plane through the pin

axis, said locating faces resting firmly against corresponding locating faces 8, 82 of the pin bearings 3, 4. The inward-facing locating faces 9, 91 of the pin bearings are stepped, like the end faces of the bushing. The width of the bushing is a little smaller than the distance between the locating faces 9, 91 of the pin bearings, such that
5 clearances 10, 101 arise, which allow the necessary thermal expansion of the bushing. The stepped construction of the end faces of the bushing ensures that the bushing 5 is secured against participation in the oscillatory motion of the connecting rod, without being prevented from expanding freely under heat. In the bore in the bushing 5 there
10 are to be found a number of annular channels 11, which are connected by ducts 12 to the feed duct 13 of the connecting rod 18. The duct 13 passes through the lower shell 14 of the connecting rod liner, such that it opens into the lubrication ducts 15 distributing the lubricating oil over the load-carrying surfaces of the bushing 5 and the lower shell 14, so ensuring lubrication of the lower shell. To lubricate the upper shell, ducts 16 extend from the annular channels 11, whereby the oil is collected again in
15 order to flow out from there into the lubrication channel 17 of the upper shell 141 of the connecting rod small end, whence the oil flows back to the lubricating oil container. The bushing does not enclose the pin 2 more tightly than so as to allow unhindered thermal expansion, and the bushing itself is cooled by the lubricant flowing through the ducts 12, 16 and the annular channels 11. It is not necessary to
20 use all the annular channels 11 as elements of the lubrication system, some of them may remain filled with air, such that they prevent heat transfer between the bushing and the piston pin. It is also possible to use the turned grooves or annular channels 11 as circulating spaces for a cooling fluid other than the lubricant.

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CLAIMS:

1. A knuckle joint between piston and connecting rod, in particular for pistons of internal combustion engines, in which a bushing consisting of one or more pieces and secured against rotation about the piston pin surrounds the piston pin, the outside 30 of which bushing serves as load-carrying and bearing surface for the connecting rod small end, characterised by the provision in the surface with which the bushing (5) sits on the piston pin (2) of annular channels (11), indentations or other turned grooves which prevent heat transfer or serve as circulating spaces for cooling fluid or the lubricating oil used for cooling.
- 35 2. A knuckle joint according to claim 1, characterised in that the annular channels (11) are connected to a forced-feed lubrication feed line by holes passing through the bushing wall.

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1 page drawings
